Message

From: McCord, James [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=MCCORD, JAMES]
Sent: 7/19/2019 2:53:20 PM
To: Strynar, Mark [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5a9910d5b38e471497bd875fd329a20a-Strynar, Mark]; David Muddiman [dcmuddim@ncsu.edu]
Subject: RE: Hoppin PFC method

Dave,

If it is the white plastic SpeedVac rotors you are talking about I believe they are made with HDPE rather than Teflon. I do know that some rotors are Teflon coated for cleaning purposes, but every one that I have seen indicated that it was coated (that's added value that they can charge you for).

The instruments are only 15 years old, not 20.

--
James McCord

From: Strynar, Mark
Sent: Friday, July 19, 2019 9:45 AM
To: David Muddiman <dcmuddim@ncsu.edu>
Cc: McCord, James <mccord.james@epa.gov>
Subject: RE: Hoppin PFC method

We use a TurboVap to dry down our stuff with N2 gas and a heated water bath. No issue with contamination.
Like this one but older. James will tell you it is 20 years old but it is not. I have only been here 17 years.

https://www.biotage.com/product-page/turbovap-classic-lv

Mark

From: David Muddiman <dcmuddim@ncsu.edu>
Sent: Friday, July 19, 2019 9:42 AM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Cc: McCord, James <mccord.james@epa.gov>
Subject: Re: Hoppin PFC method

Hi James and Mark

What speedvac do you use to dry down SPE samples? I am worried about contamination from rotors which look like Teflon to me. Thanks for any advice. Dave

Sent from my iPhone, Please forgive brevity and typos :-)

On Jul 19, 2019, at 7:36 AM, David Muddiman <dcmuddim@ncsu.edu> wrote:

Thanks very much Mark for those details. I was worried that they went to you and said NC State wants our stuff and they tell us you want their stuff - we are in same boat, curious, interested in learning more, but just initial discussions. Thanks very much. I hope you are both doing well. Have a great weekend. Dave

On Fri, Jul 19, 2019 at 7:34 AM Strynar, Mark <Strynar.Mark@epa.gov> wrote:

> Dave,
>
> We met with them last week. They claim their QTOF is better than other manufactures. Of course they would, what manufacturer would not say that. James seemed to be impressed with their scan speed I think??? I suggested we have some samples we exchange with them we have already done work on with our Orbitrap Fusion or Agilent QTOF and see what they can see. They seem amenable for e CRADA with us which would allow for the exchange of equipment and samples with my lab. Not details yet, just the first discussions.
>
> Mark
>
> **From:** David Muddiman <dcmuddim@ncsu.edu>
> **Sent:** Friday, July 19, 2019 7:29 AM
> **To:** Strynar, Mark <Strynar.Mark@epa.gov>
> **Cc:** Detlef R. U. Knappe <knappe@ncsu.edu>; Jane Hoppin <jahoppin@ncsu.edu>; Jeffrey Enders <jrenders@ncsu.edu>; Nadine Kotlarz <nkotlar@ncsu.edu>
> **Subject:** Re: Hoppin PFC method
>
> Thanks Mark, very helpful. Also, curious, Shimdazu indicated you might get one of their systems? is that true. They came to NC State and talked with all of us, but I did not see any real advantage of their system, and it seems they are still working out the integration. Any thoughts would be welcomed. Dave
>
> On Fri, Jul 19, 2019 at 7:25 AM Strynar, Mark <Strynar.Mark@epa.gov> wrote:
>
> > All,
> >
> > We have seen this as well on our MS systems. The fluoroethers decarboxylate readily at lower temp and voltage compared to other PFCAs and PFSAs. One work around it to monitor for the decarboxylated ion as the primary. Then you may only get one ion as the primary MRM is CO2 loss. I

see this is what many contact labs are doing when I see their methods. We also find the perfluoro-ethers readily form gas phase H+ and Na+ dimers, with the M-H- ion being small to non-existant.

We also know that HFPO-DA and at least 2 others we know of HFPO-TA, HFPO-TetA are not stable in DMSO. They turn into H substituted perfluoro-ethers in the carboxylate position. I expect PMPA, and PEPA will do the same.

Mark

From: Detlef Knappe <knappe@ncsu.edu>
Sent: Thursday, July 18, 2019 9:57 PM
To: David Muddiman <dcmuddim@ncsu.edu>
Cc: Jane Hoppin <jahoppin@ncsu.edu>; Strynar, Mark <Strynar.Mark@epa.gov>; Jeffrey Enders <jrenders@ncsu.edu>; Nadine Kotlarz <nkotlar@ncsu.edu>
Subject: Re: Hoppin PFC method

Hi Dave,

The main consideration is sensitivity. The sulfonic acids ionize better at higher temp, giving us lower reporting limits. But at the higher temp, you obliterate the fluoroether carboxylic acids. So we have to run those at a lower temp. Lee Ferguson is seeing the same and is running both the low and high temp method to get the reporting limits we need. On an instrument with high sensitivity, it may be possible to just run at low temp, and I have asked Becca to check reporting limits she can get for all compounds using the low temp method. Please let us not reinvent things from scratch - we have been doing this for quite some time now. We need to make progress on samples. The days between now and July 29 are absolutely critical for getting results. If we spend more time on method development, we will be going to conferences in August and have nothing to report.

Another thing we just learned is that the branched ethers (PMPA, PEPA, GenX) are not stable in acetonitrile. We need to make all standards in methanol. And for carboxylic acids we need to use basic methanol to prevent the formation of methyl esters.

Best,

Detlef

On Thu, Jul 18, 2019 at 6:41 PM David Muddiman <dcmuddim@ncsu.edu> wrote:

Hi Mark

Perhaps you, James and my folks should have a talk about things. We are finding the analytical side of things to be strange. Does not make sense that compounds under gradient elution would have vastly different desolation temperatures given the dominate factor is solvent comp. how can this be? There is something strange here. Need to figure out ASAP. In other words why don't the compounds at higher temp work at lower temps.

And big question why with "The Devil We Know" are we still studying this after 30 years. It is known there are health efforts from PFOS and GenX. Hmmmmm

Dave

Sent from my iPhone, Please forgive brevity and typos :-)

On Jul 18, 2019, at 6:24 PM, Jane Hoppin <jahoppin@ncsu.edu> wrote:

Hi Dave

I'm including Mark Strynar since the work was done in his lab, so I'm sure he'll have some thoughts about the solvent issue

Cheers

Jane

On Thu, Jul 18, 2019 at 5:58 PM David Muddiman <dcmuddim@ncsu.edu> wrote:

Hi Nadine,

First, the low temp and high temp methods are curious to me. This should never be the case on a MS system. Something strange here going on. Solvent is solvent. So, while it might work, it does not make sense to me. I need to sort this out.

Second, just adding this and that and this and that, means an entirely new method. We need to know what you want to measure. We can get compound with suspect concentrations and some with semi-reliable concentrations and "run the samples". We need to know what matter and do significant due diligence to make sure we can provide accurate numbers versus just numbers. So, the less we have to develop and QC/QA the sooner we can make this happen. Lots of samples and lots of analytes.

Please advise, not just to Nadine but to Detlef and Jane too.

Nadine, I saw you in Whole Foods yesterday but I knew I knew you but could not piece it together until your email. Safe travels,

Dave

On Thu, Jul 18, 2019 at 4:57 PM Jane Hoppin <jahoppin@ncsu.edu> wrote:

> Thanks Nadine!
>
> On Thu, Jul 18, 2019 at 3:54 PM Nadine Kotlarz <nkotlar@ncsu.edu> wrote:
>
> > Hi Jeff,
> >
> > We should start with, at a minimum, the 28 PFAS that are covered collectively on our Ultivo QQQ low temperature and high temperature methods. Here's the list
> >
> > PFAS with standards from Chemours:
> >
> > 1. PFMOAA
> > 2. PEPA
> > 3. PMPA
> > 4. PFO2HxA

5. PFO3OA
6. GenX
7. NVHOS
8. PFO4DA
9. Hydro-EVE
10. PFO5DoA
11. Nafion byproduct 1
12. Nafion byproduct 2
13. Nafion byproduct 4

PFAS with standards that can be purchased from Wellington:

1. PFBA
2. PFBS
3. PFPeA
4. PFPeS
5. PFHxA
6. PFHxS
7. PFHpA
8. PFHpS
9. PFOA
10. PFOS
11. PFNA
12. PFDA
13. 4:2FTS
14. 6:2FTS
15. 8:2FTS

We have some more standards from Chemours that didn't make it into the Ultivo method but may be good to incorporate into your method on the Altis. Those are the ones highlighted in blue in the attached doc.

We've also been using 20 internal standards for the analysis. We purchase one mix with 19 internal standards and MGenX separately. Invoice from a past purchase attached.

I'm out of town today and tomorrow but back in the office on Monday.

Nadine

On Thu, Jul 18, 2019 at 2:42 PM Jeffrey Enders <jrenders@ncsu.edu> wrote:

> Hi Nadine,

Can I get confirmation from you on the list provided below? I am trying to get these nailed down so that I can make sure we have all of the standards and then order the ones that we don't have and get started on method development. I am basing this list on a table from the document attached. This document was given to Allison and is posted to this project on MENDIX. Thanks.

1	GenX
2	Nafionbp1
3	Nafionbp2
4	Nafionbp4
5	PFO2HxA
6	PFO3OA
7	PFO4DA
8	PFO5DoDA
9	PMPA
10	NVHOS
11	PEPA
12	PFBA
13	PFPeA
14	PFHxA
15	PFHpA
16	PFOA
17	PFNA
18	PFDA
19	PFBS
20	PFHxS
21	PFOS
22	6:2_FTS

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jrenders@ncsu.edu

On Tue, Jul 16, 2019 at 3:25 PM Jane Hoppin <jahoppin@ncsu.edu> wrote:

> We also are interested in Hydro-Eve and we also have a standard for that.
>
> Seems like we looked for 24, so want Nadine to weigh in, in case I missed one.
>
> Thanks.

On Tue, Jul 16, 2019 at 2:57 PM Jeffrey Enders <jrenders@ncsu.edu> wrote:

> Hi Jane,
>
> Thanks I found the document on MENDIX, as you suggested. Are the 22 compounds in that document the ones you are interested in analyzing for in these samples as well (see table below)? Sample prep will be the same, but the main difference between the orbitrap and the QQQ is that you have to decide what analytes you want to look for before running the samples. The QQQ is also inherently more suited to quantitation (most would argue).
>
> Thanks for the heads up on the nomenclature - I thought it was PFAS but saw Wellington refer to their catalog section as PFC so incorrectly altered my language.
>
> Thanks.

1	GenX
2	Nafionbp1

3	Nafionbp2
4	Nafionbp4
5	PFO2HxA
6	PFO3OA
7	PFO4DA
8	PFO5DoDA
9	PMPA
10	NVHOS
11	PEPA
12	PFBA
13	PFPeA
14	PFHxA
15	PFHpA
16	PFOA
17	PFNA
18	PFDA
19	PFBS
20	PFHxS
21	PFOS
22	6:2_FTS

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On Tue, Jul 16, 2019 at 2:41 PM Jane Hoppin <jahoppin@ncsu.edu> wrote:

> Hey Jeff,
>
> I'm excited to see you working on this. We already shared our blood protocol with Allison, so you should review that, so you won't be starting brand new. Someone should have shared those with you and you should work with those. I know there will be some differences between the QQQ and the orbitrap, but the sample preparation should be the same.
>
> FYI, we call these PFAS and not PFCs (PFCs include the fluorochemicals that damage the ozone layer).
>
> Please let me know if you need the document I previously sent Allison. I thought she was going to upload into Mendix
>
> Thanks.
>
> Jane
>
> On Tue, Jul 16, 2019 at 2:35 PM Jeffrey Enders <jrenders@ncsu.edu> wrote:
>
> > Hi Jane and Nadine,
> >
> > Dave and I have met and I will begin working on a PFC method for your blood samples. I don't have much information on which compounds you are primarily interested in and this will have a significant impact on the time, effort requirement, and feasibility of this study. I have been collecting information from folks about what standards we have, what methods we have already developed, and what protocols have already been written up. I will try to summarize what is available and try to get from your which compounds you are hoping to quantify.
> >
> > I will primarily be building off of protocols that Detlef's lab already runs and an instrument method that was shared by Duke and has been partially set up on our instrument. The protocol that Zack Hopkins has shared with me lists the following compounds as being detectable:

<image001.png>

<image.png>

If we stick to the first table alone, the method development step will progress much more quickly as these compounds are sold by Wellington as a mixture and so can easily be made into a calibration curve. The second table is made manually by adding all compounds one at a time and so this will increase complexity. All of the compounds in these two tables are in the method that we are working to set up on the instrument. Additionally, Wellington and Cambridge isotope labs sell additional PFC compounds. There are far too many to list here but the links can be found below:

- https://well-labs.com/wellingtoncatalogue1618.html (starting on page 140)
- https://shop.isotope.com/category.aspx?id=10032748

Adding compounds to the method beyond the tables listed in this email, while possible, will increase the complexity of the method and inherently increase the risk of internal interferences (i.e., one compound enhances or suppressed the signal of another compound in method). The method that the Knappe group use is about 20 min long and adding compounds may also necessitate making this method longer due to instrument scan speed issues.

Any information you have on compounds of interest or other thoughts or concerns would help guide the conversation. I'm looking forward to working with you on this. Thanks!

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